



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/891,730	06/25/2001	Steven Verhaverbeke	004990	1392

32588 7590 10/31/2003

APPLIED MATERIALS, INC.
2881 SCOTT BLVD. M/S 2061
SANTA CLARA, CA 95050

EXAMINER

UMEZ ERONINI, LYNETTE T

ART UNIT	PAPER NUMBER
----------	--------------

1765

DATE MAILED: 10/31/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

eb10

Office Action Summary	Application No. 09/891,730	Applicant(s) VERHAVERBEKE ET AL.	
	Examiner Lynette T. Umez-Eronini	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-121 is/are pending in the application.
- 4a) Of the above claim(s) 24-37, 101, 103, 105, 107, 111 and 113-121 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 20, 21; 41-51; 59-66; 79-96; 100; 102; 104; 106; 108; 109; 110 and 112 is/are allowed.
- 6) ☒ Claim(s) 1-19, 22, 23, 38-40, 52-58, 67-73, 75-78, 97 and 98 is/are rejected.
- 7) ☒ Claim(s) 74 and 99 is/are objected to.
- 8) ☒ Claim(s) 24-37, 101, 103, 105, 107, 111 and 113-121 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
 If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>6</u> | 6) <input type="checkbox"/> Other: |

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Group I claims 1-23, 38-100, 102, 104, 108-110, and 112 in Paper No. 9 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Objections

2. Claims 38-40 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim cannot depend from non elected claims. See MPEP § 608.01(n). Accordingly, the claims 38-40 have not been further treated on the merits.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 13 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 13, "ashing step" is indefinite because its meaning is unclear.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al. (US 4,817,652) in view of Schulz (US 5,637,151).

Liu teaches, "Centrifugal spray cleaning is an effective cleaning alternative to chemical immersion processes . . . As the wafers spin, they are subjected to a series of continuous fine sprays of reagent solution, including a hot aqueous solution of hydrogen peroxide and ammonium hydroxide, . . . and high purity water, which reads on,

A method of processing a wafer comprising: placing a wafer in a single wafer cleaning tool; spinning said wafer in said single wafer cleaning tool and while spinning

Art Unit: 1765

said wafer; after placing said wafer in said single wafer cleaning tool, exposing said wafer to a solution comprising: NH_4OH ; and H_2O .

Liu differs in failing to teach exposing the wafer to a chelating agent, **in claim 1**.

Schulz teaches adding EDTA to a chemical solution containing NH_4OH , H_2O_2 , and H_2O (Abstract and claim 1).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Liu's cleaning solution by adding Schulz's EDTA for the purpose of reducing metal contamination on the surface of a silicon wafer (Schulz, Abstract).

8. Claims 15-19 and 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu (US '652) in view of Schulz (US '151) as applied to claim 1 above, and further in view of Olesen et al. (US 5,996,595).

Liu in view of Schulz differs in failing to teach the solution comprises a surfactant as recited in claims 15-19.

Olesen shows a surfactant is introduced with DI water, NH_4OH , and H_2O_2 in Figure 4 (column 8, lines 44-45).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Liu in view of Schulz by adding a surfactant, as taught by Olesen for the purpose of protecting the wafer from NH_4OH and reduce the surface tension of the DI water (Olesen, column 8, lines 53-54).

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 52-58 are rejected under 35 U.S.C. 102(b) as being anticipated by Cohen et al. (EP 0 860866 A1).

Cohen teaches cleaning microelectronic devices by controlling the cleaning by vacuum-degassing water obtained from a water supply and adding gas back to said vacuum-degassed water (Abstract and claim 1).

Claim Rejections - 35 USC § 103

11. Claims 67-73 and 75-78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's prior art in view of Ramachandran (US 6,074,935).

Applicant's admitted prior art teaches, "Wet etching and wet cleaning of silicon wafer is usually done by immersing silicon wafers into a liquid containing HF-SC1-SC2 (Specification, [0003], lines 1-7), which reads on,

A method of processing a wafer comprising: placing said wafer in a single wafer cleaning tool; after placing said wafer in said single wafer cleaning tool, dispensing an HF solution on said wafer to produce an HF covered wafer; and after dispensing said HF solution on said wafer, dispensing a cleaning solution on said HF covered wafer.

Art Unit: 1765

Applicant's admitted prior art differs in failing to recite 2-3 seconds between dispensing an HF solution on the wafer to produce an HF covered wafer, **in claim 67**.

Ramachandran teaches, "Etching can be achieved, for example, by a wet chemical processing. Typically, during such wet chemical processing, the surface of the semiconductor wafer is contacted with an acid, e.g., dilute hydrofluoric acid. Suitable parameters for patterning and wet chemical processing (e.g., choice of etchant, concentration of etchant, time, temperature, etc.) are well known" (column 2, lines 48-54), which provides evidence that the time is a so-called "result effective variable."

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify applicant's admitted prior art by using Ramachandran's method of choosing a suitable processing time, which is a so-called result effective variable, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claim Rejections - 35 USC § 102

12. Claims 97 rejected under 35 U.S.C. 102(b) as being anticipated by applicant's admitted prior art.

Applicant's prior art teaches, "Wet etching and wet cleaning of silicon wafer is usually done by immersing silicon wafers into a liquid containing HF-SC1-SC2 (Specification, [0003], lines 1-7), which reads on,

Art Unit: 1765

A method of processing a wafer comprising: placing a wafer in a single wafer cleaning tool; after placing said wafer in said single wafer cleaning tool, dispensing an HF solution on said wafer; and cleaning said wafer with a cleaning solution.

13. Claim 98 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's prior art, as applied to claim 97 above, and further in view of Liu (US '652).

Applicant's admitted prior art differs in failing to teach spinning said wafer during said processing.

Liu teaches, "Centrifugal spray cleaning is an effective cleaning alternative to chemical immersion processes . . . As the wafers spin, they are subjected to a series of continuous fine sprays of reagent solution, . . ." (column 3, lines 50-58).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify applicant's admitted prior art by using Liu's method of spinning a wafer while cleaning since centrifugal spray cleaning is an effective cleaning alternative to chemical immersion processes (Liu, column 3, lines 50-52).

Allowable Subject Matter

14. Claims 20, 21; 41-51; 59-66; 79-96; 100; 104; 106; 108; 109; 110 and 112 are allowed.

15. The following is a statement of reasons for the indication of allowable subject matter: Prior art fails to teach exposing a wafer to a cleaning solution comprising NH_4OH , H_2O_2 , and a chelating agent along with polyoxyethylene butyphenl ether and

Art Unit: 1765

with polyoxyethylene alkylphen sulfate, in claims 20 and 21; the sequence of the cleaning in claims 41-51, 79-96, 100; cleaning a wafer with N,N'-Bis(2-hydroxyphenyl)ethylenediiminodiacetic acid (HPED), in claim 102; a cleaning a wafer with desferriferrioxamin B and N,N',N''-Tris[2-N-hydroxycarbonyl)ethyl]-1,3,5-benznetricarboxamide (BAMTH) in claims 106 and 108-110; cleaning a wafer with triethylenetrinitrilohexaacetic acid (TTHA), in claim 104; and cleaning a wafer with molybdic acid, in claim 112.

16. Claims 74 and 99 are objected to as being dependent upon a rejected claim.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 703-305-2667. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

ltue

October 1, 2002

NADINE G. NORTON
PRIMARY EXAMINER

